BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services	)	WT Docket No. 03-264

REPLY COMMENTS OF ERICSSON INC

Ericsson Inc ("Ericsson") hereby submits these reply comments concerning changes that the Federal Communications Commission ("FCC" or "Commission") proposed in ¶¶ 13-18 of its *Notice of Proposed Rulemaking ("NPRM")*, released January 7, 2004,[1] relating to its Part 24 base station Equivalent Isotropically Radiated Power ("EIRP") and transmitter output power limits.

Generally, a number of parties agree that the Commission should eliminate the output power restriction on transmitters and increase EIRP levels permitted for base stations. However, commenters disagree on how the Commission should apply the base station EIRP increase. Ericsson respectfully recommends that the Commission adopt the narrowband/wideband rule structure proposed by Motorola and higher EIRP limits based on Qualcomm's proposal[2] as a compromise that will not limit the development of current

[1] *Notice of Proposed Rulemaking, In the Matter of Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services*, WT Docket No. 03-264, 19 FCC Rcd. 708 (rel. Jan. 7, 2004).

[2] *See*, Comments of Motorola, Inc., *In the Matter of Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services*, WT Docket No. 03-264 (fil. Apr. 23, 2004), ("Motorola Comments") at 4; Comments of Qualcomm Incorporated, *In the Matter of Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services*, WT Docket No. 03-264 (fil. Apr. 23, 2004), ("Qualcomm Comments") at 3.

or future radio access technologies.[3] In this way, the Commission will promote its policy goals, such as improving PCS coverage in rural areas, and also ensure that the rule is technology neutral in both rural and urban environments.

Specifically, Ericsson recommends that the Commission:

- Ensure that changes to its existing rules do not negatively impact current or future systems and technologies;
- Eliminate all references to "peak" or, alternatively, also include references to "average" each time "peak" is mentioned in Section 24.232 (a), (b), and (c) so that the rule will permit output power measurements on either a "peak" or "average" basis, without restriction;
- Revise its Section 24.232(a) base station EIRP limit to 6560 watts/MHz for channel bandwidths 1 MHz and greater, and 6560 watts per carrier for channel bandwidths less than 1 MHz; and
- Mirror these base station EIRP and "peak" rule changes in Section 27.50(d)(1) of its Advanced Wireless Services ("AWS") rules to ensure regulatory parity.

I. The Commission's Rule Should Permit Output Power Limit Measurements on an Average as well as Peak Basis

In its initial comments, Ericsson asked the Commission to eliminate references to measuring output power on a "peak" basis when it revises Section 24.232.[4] With this change, measurements may be made on either a "peak" or "average" basis.[5] Ericsson

[3] Ericsson has worked to develop a compromise position based on industry comments that will satisfy different parties' concerns. It will continue to work with industry participants to refine these positions, as appropriate.

[4] Comments of Ericsson Inc, *In the Matter of Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services*, WT Docket No. 03-264 (fil. Apr. 23, 2004), ("Ericsson Comments") at 10-11.

[5] Alternatively, the Commission could retain "peak" and add "average" as an alternative measurement basis.

noted that making this change will conform the rule to current Commission practice, since the Commission currently allows average detection as an alternative to peak measurements for both transmitting carriers' and out-of-band emissions.[6] This change will also make the rule independent of radio access technology used. Average, not peak, measurements provide more accurate and relevant information for output power of technologies that have non-constant envelop signals, such as CDMA 2000 or W-CDMA.

For these reasons, it is very important that the Commission also address "peak" in its revision of Section 24.232. In this way, the Commission will provide clarity on the proper application of its rule. It will also ensure that it has the requisite information to determine power in the entire band, representative of output power, for technologies such as CDMA 2000 or W-CDMA.

II. The Commission Should Eliminate Transmitter Output Power Limits and Increase Base Station EIRP Limits in Section 24.232(a)

A. *Overview*

The majority of commenters on Section 24.232(a) agree on certain key points regarding transmitter output power and base station EIRP limits. Generally, a number of parties agree that increasing power limits will improve service in rural areas, encourage improved technology, and achieve other benefits.[7] With flexibility to use higher EIRP, rural operators will be able to expand the reach of their existing systems and reduce the

[6] *Id.* at 10.

[7] *See*, Ericsson Comments at 3; Motorola Comments at 4; Qualcomm Comments at 2, 8; Comments of Powerwave Technologies, Inc., *In the Matter of Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services*, WT Docket No. 03-264 (fil. Apr. 23, 2004), ("Powerwave Comments") at 6; Comments of Cingular Wireless LLC, *In the Matter of Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services*, WT Docket No. 03-264 (fil. Apr. 23, 2004), ("Cingular Comments") at 3-4.

number of transmitting facilities required to provide service.[8] Additionally, rural operators will have more flexibility to determine system architecture, including the number of base stations they deploy to serve a particular area.[9] Through these means, rural operators will be able to operate more efficiently, expand services, and extend coverage.

In a similar way, increasing the base station EIRP limit will provide a direct benefit for urban area applications. For example, urban operators will be able to improve the indoor coverage, grade, and quality of service provided to urban customers.

Moreover, eliminating or increasing EIRP limits will promote use of new technologies, such as higher gain directional antennas, and will encourage improvements in the design of subscriber products. Higher gain antennas improve performance in both the reverse link and forward link directions and translate directly into improved coverage without requiring as many base stations.

For these reasons, almost all parties who commented on the transmitter limit support eliminating the 100 watt transmitter output power limit in Section 24.232(a).[10] Also, a number of parties who commented on the base station limit agree that the

[8] *See*, Powerwave Comments at 6; Qualcomm Comments at 8; Motorola Comments at 4.
[9] *See*, Powerwave Comments at 6; Motorola Comments at 2; Ericsson Comments at 3-4.
[10] *See*, Motorola Comments at 2; Qualcomm Comments at 3; Ericsson Comments at 1; Powerwave Comments at 2, supporting elimination of the limit**.** Lucent opposes eliminating the limit because it may require certification to be based on effective radiated electric field strength, which is more difficult than transmitter output power to define and more burdensome. Alternatively, Lucent supports Powerwave's suggestion that certification be independent of transmitter power limits and be based on compliance with out-of-band emissions limits. In this case, Lucent would support elimination of the limit. Ericsson supports comments made by Powerwave and Lucent that certification should be based on out-of-band emission limits, as set forth in 47 C.F.R. § 24.238. *See,* Comments of Lucent Technologies Inc., *In the Matter of Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services*, WT Docket No. 03-264 (fil. Apr. 23, 2004), ("Lucent Comments") at 2.

Commission should modify or increase base station EIRP limits.[11] The parties presented different proposals on how the Commission should apply changes to base station EIRP limits, as discussed below in sections (c) and (d).

B. *Certain Important Public Policies Should Guide the FCC's Reevaluation of EIRP Limits*

Ericsson recommends that the Commission follow certain policy goals in reevaluating its EIRP limits. First, the Commission should make rule changes that improve the economic viability of PCS and AWS operations in rural areas. The Commission has proposed changes in other dockets to promote increased PCS coverage and efficient operations in rural areas.[12] It can make complementary changes here that further the same goals. Second, if the Commission revises EIRP limits, it should not make any changes that negatively impact existing or future base station deployments of any technology that rely on the *de facto* interpretation of the EIRP limit on a "per-carrier" basis (the same as "per-transmitter" limit before Multi-Carrier Power Amplifiers were available).[13]

C. *Proposals for Measuring EIRP Limits*

In its initial comments, Ericsson made recommendations on measuring transmitter output power limits and did not address EIRP limits for base stations. Ericsson recommended that the Commission apply transmitter output power limits on a per-carrier basis (if it retained any transmitter output limit at all) to update the actual language of its

[11] *See*, Ericsson Comments at 11; Motorola Comments at 3; Qualcomm Comments at 3; Powerwave Comments at 2; Cingular Comments at 4.

[12] *See, e.g., Notice of Proposed Rulemaking, In the Matter of Facilitating the Provision of Spectrum-Based Services to Rural Areas and Promoting Opportunities for Rural Telephone Companies To Provide Spectrum-Based Services, 2000 Biennial Regulatory Review Spectrum Aggregation Limits For Commercial Mobile Radio Services, Increasing Flexibility To Promote Access to and the Efficient and Intensive Use of Spectrum and the Widespread Deployment of Wireless Services, and To Facilitate Capital Formation,* WT Docket Nos. 02-381, 01-14, and 03-202, 18 FCC Rcd. 20,802 (rel. Oct. 6, 2003).

[13] *See,* Powerwave Comments at 5-6; Ericsson Comments at 7-8; Lucent Comments at 1.

rule consistent with technological developments and to ensure technological neutrality.[14] Primarily, Ericsson supported measuring transmitter output power limits on a per-carrier basis as a means to increase coverage for rural applications and capacity for urban applications. The per-carrier definition for technologies with bandwidth below 1 MHz will also enable operators to increase the capacity, grade, and quality of service in a very cost efficient way for urban applications.[15]

Other parties discussed the proper application of EIRP limits. Motorola recommended that the FCC apply base station EIRP limits on a per-carrier basis for narrowband carriers. Motorola said that applying a power spectral density measurement to carriers less than 1 MHz "would impose limits in excess of what are currently available and would negatively impact current systems and technologies."[16] Ericsson agrees with Motorola that the Commission should apply EIRP limits on a per-carrier basis for carriers less than 1 MHz. In this respect, Motorola's position is consistent with Ericsson's recommendation that the Commission revise its rules so that operators may increase power to extend coverage in rural environments and allow capacity expansion in urban applications.

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[14] *See*, Ericsson Comments at 5.

[15] In addition, any application of transmitter output power limits should apply on a sector basis to facilitate frequency reuse. According to the FCC's rules, the EIRP of a carrier is "[t]he product of the power supplied to the antenna and the antenna gain *in a given direction* relative to an isotropic antenna." 47 C.F.R. §24.5 (emph. added). Therefore, it is proper to measure radiated power based on EIRP emitted within the sector. As the Commission clarified in its *Third Memorandum Opinion and Order, In the Matter of the Amendment of the Commission's Rules to Establish New Personal Communications Services*, GEN Docket No. 90-314, 9 FCC Rcd. 6,908, 6,918 (rel. Oct. 19, 1994) (emph. added):

> As regards power levels per transmitter, antenna or antenna element it was always our intent that the 100 watts per channel and 1640 watts EIRP requirements apply to these individual components and not to the sum of all components at the entire base station provided the maximum EIRP radiated by the base station *in any given direction* on any given channel does not exceed 1640 watts.

[16] Motorola Comments at 3.

Motorola also recommended that the Commission apply a power spectral density measurement for carriers with channel bandwidths 1 MHz or greater to ensure technological neutrality.[17] Going further, Qualcomm supported use of power spectral density for all technologies.[18] Qualcomm maintained that applying EIRP limits on a per-carrier basis favors narrowband technologies over wideband technologies since more narrowband carriers can exist in the same spectrum bandwidth.[19]

As a compromise, Ericsson supports EIRP limits on a per-carrier basis for carrier bandwidths less than 1 MHz and a power spectral density measurement for carriers with channel bandwidths 1 MHz or greater. In this way, technologies will be treated in a mutually beneficial way for both urban and rural environments.

D. *Proposals for Increasing EIRP Limits*

While Motorola proposed that the Commission measure wideband and narrowband EIRP levels differently, it used the existing 1640 watt limit for both.[20] In contrast, Qualcomm proposed that the Commission adopt a base station power limit of 5040 watts EIRP/MHz for all technologies, or approximately six dB (four times) above the present limit, measured in 1 MHz.[21]

Ericsson agrees with Qualcomm that, since the Commission adopted the 1640 watt EIRP limit in its original PCS technical rules, there have been substantial improvements in low-noise amplifier and receiver technology.[22] In particular, the sensitivity of receivers has improved significantly, far beyond performance technically

[17] *Id.* at 3-4.
[18] Qualcomm Comments at 2.
[19] *Id.* at 5.
[20] Motorola Comments at 4. Motorola proposed limits of 1640 watts/MHz for wideband and 1640 watts/carrier for narrowband.
[21] Qualcomm Comments at 3.
[22] *Id*. at 2.

possible in the early 1990's (*e.g.*, tower mounted low-noise amplifiers, four-branch receiver diversity). A reasonable reflection of this improvement, as stated by Qualcomm, is 6 dB or approximately 4 times the *present* limit. This improved technology allows operators, especially in rural environments, to provide greater range on the reverse link in circumstances where extended coverage is desirable, but where capacity needs are not substantial. As Qualcomm points out, to enable rural wireless operators to take advantage of these technological improvements, they must operate their base stations at higher power so that they can also extend the forward link range.[23]

Ericsson recommends that the Commission combine the narrowband/wideband rule structure that Motorola proposes with higher EIRP limits based on Qualcomm's proposal. Increasing the current 1640 watt EIRP limit by four times, to reflect current improvements in antenna, amplifier and receiver technology, increases the limit to 6560 watts**.** The combined revision will not negatively impact existing or future base station deployments of any technology that rely on the *de facto* interpretation of the EIRP limit on a per-carrier basis and will not risk increased harmful interference.[24]

If the Commission incorporates these changes, its rule will read as follows, in pertinent part:[25]

> Sec. 24.232 Power and antenna height limits
>
> (a) Base stations are limited to <u>an</u> ~~1640 watts peak~~ equivalent isotropically radiated power (e.i.r.p.) <u>of 6560 watts/MHz for channel bandwidths 1 MHz and greater, and 6560 watts per carrier for channel bandwidths less than 1 MHz</u> with an antenna height up to 300 meters HAAT.

[23] *Id.*

[24] The Commission already has rules in place that control interference where operators are using different frequency blocks within the same geographic area (47 C.F.R. § 24.238) and where operators are using the same frequency blocks in different geographic markets (47 C.F.R. § 236). Therefore, other rules prevent harmful interference and the Commission does not need to rely on Section 24.232(a) for that purpose.

[25] Ericsson included its proposed revisions to Section 24.232 (b) and (c) to eliminate "peak" at Appendix A to its initial comments.

III. The Commission Should Conform its Part 27 AWS Base Station EIRP Limits to these Part 24 Revisions

The Commission is also investigating streamlining and harmonizing its Part 27 rules in this proceeding.[26] Ericsson agrees with Motorola's general comment that the Commission should make parallel revisions to its Part 27 rules.[27] Applying the same EIRP limit and removing the ambiguity of "peak" in Sections 24.232(a) and 27.50(d)(1) will eliminate any concerns about regulatory parity. As with the Part 24 revision, allowing more power will also facilitate deployment of services in rural areas by allowing greater coverage while using less infrastructure.[28] Ericsson supports the following rule revision:

> §27.50 Power and antenna height limits.
>
> (d)(1) Fixed stations transmitting in the 1390-1392 MHz and 1432-1435 MHz bands are limited to 2000 watts EIRP peak power. Fixed stations transmitting in the 1392-1395 MHz band are limited to 100 watts EIRP peak power. Base stations transmitting in the 2110-2155 MHz bands are limited to an equivalent isotropically radiated power (EIRP) of 6560 watts/MHz for channel bandwidths greater than 1 MHz, and 6560 watts per carrier for channel bandwidths less than 1 MHz.

V. Conclusion

The Commission should not make changes to the existing rules that will negatively impact current or future systems and technologies. Rather, the Commission should strive to streamline rules and remove disparities in potential applications of the rules between narrowband and wideband technologies in both urban and rural environments. Specifically, the Commission should:

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[26] *NPRM* at ¶4.
[27] Motorola Comments at 4.
[28] *Id.*

- Modify the EIRP limit in Section 24.232(a) to 6560 watts/MHz for channel bandwidths 1 MHz and greater, and 6560 watts per carrier for channel bandwidths less than 1 MHz;
- Mirror these base station EIRP and "peak" rule changes in its Part 27 AWS technical rules (Section 27.50(d)(1));
- Remove "peak" as the only measurement basis in Sections 24.232(a), (b), and (c), so that the rule will permit measurements on an "average" basis as well, without restriction, or add "average" as an alternative measurement basis so that both methods are expressly included in the rule text; and
- Eliminate the 100 watt transmitter output power limit entirely in Section 24.232(a).

These rule changes will promote important policy goals, including improved coverage and cost-effective operations for rural wireless carriers, and ensure that the Commission's rules are applied in a technologically neutral manner. In the future, the Commission may want to consider increasing EIRP limits six or seven times the current 1640 limit to recognize even greater advances in antenna technology that are now being incorporated into wireless systems. The Commission should continue to update its rules to keep pace with technological changes so that operators can bring the full advantages of new technology to wireless consumers.

Respectfully submitted this 24th day of May, 2004.

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